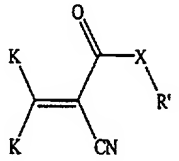
We claim:

1. A composition comprising a chemical moiety comprising the structure:



wherein:

K is H;

X is O, NR, S or Se;

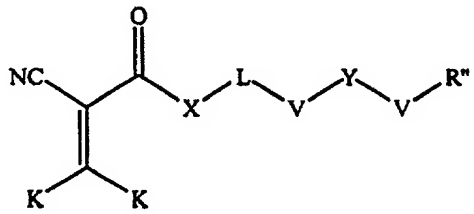
R is absent, -H, -$(CH_2)_n$alkyl, -$(CH_2)_n$alkenyl, -$(CH_2)_n$alkynyl, -$(CH_2)_n$cycloalkyl, -$(CH_2)_n$heterocyclyl, -$(CH_2)_n$aryl or -$(CH_2)_n$heteroaryl;

n is an integer from 0 to 10;

R' is a substituted organic residue; and

[R'--X] comprises at least one member selected from the group consisting of amino acid residues, payloads and branched polyfunctional groups.

2. The composition of claim 1, wherein said structure comprises:



wherein:

K is H;

X is O, NR, S or Se;

R, independently for each occurrence, is -H, -$(CH_2)_n$alkyl, -$(CH_2)_n$alkenyl, -$(CH_2)_n$alkynyl, -$(CH_2)_n$cycloalkyl, -$(CH_2)_n$heterocyclyl, -$(CH_2)_n$aryl or -$(CH_2)_n$heteroaryl;

n, independently for each occurrence, is an integer from 0 to 10;

R" is a substituted organic residue;

L is absent or is $-(CH_2)_n$alkyl, $-(CH_2)_n$alkenyl-, $-(CH_2)_n$alkynyl-, $-(CH_2)_nO(CH_2)_p$-, $-(CH_2)_nNR(CH_2)_p$-, $-(CH_2)_nS(CH_2)_p$-, $-(CH_2)_n$alkyl$(CH_2)_p$-, $-(CH_2)_n$alkenyl$(CH_2)_p$-, $-(CH_2)_n$alkynyl$(CH_2)_p$-, $-O(CH_2)_n$-, $-NR(CH_2)_n$-, or $-S(CH_2)_n$-;

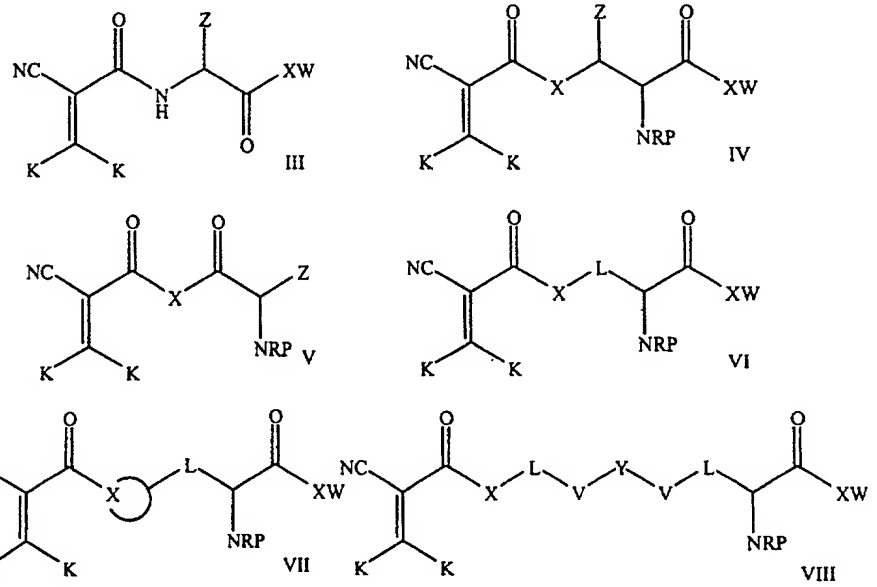
p is an integer from 0 to 10;

Y is absent or is C=O, SO_2, SO or C=S;

V, independently for each occurrence, is absent or is NR, O, S or Se; and

[R"--X] comprises at least one member selected from the group consisting of amino acid residues, payloads and branched polyfunctional groups.

3. The composition of claim 1, wherein said structure comprises one of Formulae III-VIII:



wherein:

K is H;

X, independently for each occurrence, is O, NR, S, or Se;

R, independently for each occurrence, is -H, $-(CH_2)_n$alkyl, $-(CH_2)_n$alkenyl, $-(CH_2)_n$alkynyl, $-(CH_2)_n$cycloalkyl, $-(CH_2)_n$heterocyclyl, $-(CH_2)_n$aryl or $-(CH_2)_n$heteroaryl;

n, independently for each occurrence, is an integer from 0 to 10;

L, independently for each occurrence, is absent or represents $-(CH_2)_n$alkyl-, $-(CH_2)_n$alkenyl-, $-(CH_2)_n$alkynyl-, $-(CH_2)_nO(CH_2)_p$-, $-(CH_2)_nNR(CH_2)_p$-, $-(CH_2)_nS(CH_2)_p$-, $-(CH_2)_n$alkyl$(CH_2)_p$-, $-(CH_2)_n$alkenyl$(CH_2)_p$-, $-(CH_2)_n$alkynyl$(CH_2)_p$-, $-O(CH_2)_n$-, $-NR(CH_2)_n$-, or $-S(CH_2)_n$-;

p, independently for each occurrence, is an integer from 0 to 10;

Y is absent or is C=O, SO_2, SO or C=S;

V, independently for each occurrence, is absent or is NR, O, S or Se;

P, independently for each occurrence, is H, lower alkyl or a nitrogen-protecting group;

W, independently for each occurrence, is $-(CH_2)_n$alkyl, $-(CH_2)_n$alkenyl, $-(CH_2)_n$alkynyl, $-(CH_2)_n$cycloalkyl, $-(CH_2)_n$heterocyclyl, $-(CH_2)_n$aryl or $-(CH_2)_n$heteroaryl, one or more amino acid residues, or a payload; and

Z, independentlyfor each occurrence, is -H or a substituted or unsubstituted alkyl, alkenyl, alkynyl, cycloalkyl, aralkyl, aryl, or heterocyclyl.

4. The composition of claim 1, wherein R'--X is an amino acid residue.

5. The composition of claim 1, wherein R'--X is a residue of an amino acid selected from the group consisting of glycine, alanine, valine, cysteine, leucine, isoleucine, serine, threonine, methionine, glutamic acid, aspartic acid, glutamine, asparagine, lysine, arginine, proline, histidine, phenylalanine, tyrosine and tryptophan.

6. The composition of claim 4, wherein said residue is of an amino acid selected from the group consisting of glycine, alanine, valine, cysteine, leucine, isoleucine, serine, threonine, methionine, glutamic acid, aspartic acid, glutamine, asparagine, lysine, arginine, proline, histidine, phenylalanine, tyrosine, tryptophan, and an analog, derivative or congener of any of the foregoing.

7. The composition of claim 5, wherein said amino acid is an (L) stereoisomer.

8. The composition of claim 1, wherein R'--X comprises a payload.

9. The composition of claim 1, wherein R'--X comprises a therapeutic agent.

10. The composition of claim 9, wherein said therapeutic agent comprises a vaccine.

11. The composition of claim 9, wherein said therapeutic agent comprises at least one member selected from the group consisting of analgesics; antiasthmatics; anticonvulsants; antidepressants; antiemetics; antigens and antibodies thereto; antihistamines; antihypertensive agents; antinauseants; anti-Parkinson agents; antispasmodics; apoproteins, bronchodilators; beta-blockers; chemotherapeutic agents; cardiovascular agents; central nervous system agents; coenzymes; decongestants; diuretics; enzymes; enzyme inhibitors; expectorants; glycoproteins; H-2 antagonists; haptens and antibodies thereto; hormones, lipids, liposomes; mucolytics; muscle relaxants; protein analogs in which at least one non-peptide linkage replaces a peptide linkage; phospholipids; prostaglandins; receptors and other membrane proteins; retro-inverso

oligopeptides; stimulants; toxins; tranquilizers; and vitamins and mineral and nutritional additives.

12. The composition of claim 9, wherein said therapeutic agent comprises at least one member selected from the group consisting of antibiotics, antimicrobials, antiseptics, bacteriocins, bacteriostats, disinfectants, steroids, anesthetics, antifungal agents, anti-inflammatory agents, antibacterial agents, antiviral agents, antitumor agents, growth promoting substances, and antioxidants.

13. The composition of claim 1, wherein R'--X comprises an imaging agent.

14. The composition of claim 13, wherein said imaging agent comprises at least one moiety selected from the group consisting of radionuclides, atoms with unpaired spin electrons, free radicals and contrast agents.

15. The composition of claim 13, wherein said imaging agent is detectable through its emission of light, radioactivity or chemical signals.

16. The composition of claim 13, wherein said imaging agent is detectable through absorbing or reflecting radiation.

17. The composition of claim 1, wherein R'--X comprises a targeting moiety.

18. The composition of claim 17, wherein said targeting moiety comprises at least one member selected from the group consisting of lipids, antibodies, lectins, ligands, sugars, steroids, hormones, nutrients and proteins.

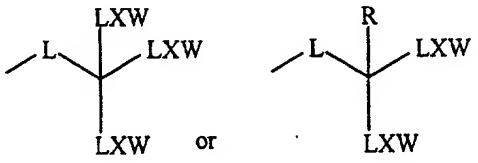
19. The composition of claim 17, wherein said targeting moiety comprises an internalizing polypeptide sequence.

20. The composition of claim 17, wherein said targeting moiety comprises at least one molecule selected from the group consisting of biotin, folates, riboflavin, carnitine, inositol, lipoic acid, niacin, pantothenic acid, thiamin, pyridoxal, ascorbic acid, lipid soluble vitamins A, D, E and K, steroidal lipids and steroidal hormones

21. The composition of claim 17, wherein said targeting moiety comprises an antibody or an antisense oligonucleotide.

22. The composition of claim 17, wherein said targeting moiety is selected from the group consisting of antigens, antisense oligonucleotides, antibodies, lectin, receptor ligands and sugars.

23. The composition of claim 1, wherein R' comprises the structure:

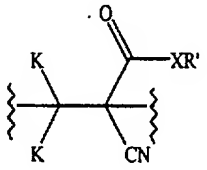


L, independently for each occurrence, is absent or is -$(CH_2)_n$alkyl-, -$(CH_2)_n$alkenyl-, -$(CH_2)_n$alkynyl-, -$(CH_2)_nO(CH_2)_p$-, -$(CH_2)_nNR(CH_2)_p$-, -$(CH_2)_nS(CH_2)_p$-, -$(CH_2)_n$alkyl$(CH_2)_p$-, -$(CH_2)_n$alkenyl$(CH_2)_p$-, -$(CH_2)_n$alkynyl$(CH_2)_p$-, -$O(CH_2)_n$-, -$NR(CH_2)_n$-, or -$S(CH_2)_n$-;

p, independently for each occurrence, is an integer from 0 to 10; and

W, independently for each occurrence, is -$(CH_2)_n$alkyl, -$(CH_2)_n$alkenyl, -$(CH_2)_n$alkynyl, -$(CH_2)_n$cycloalkyl, -$(CH_2)_n$heterocyclyl, -$(CH_2)_n$aryl or -$(CH_2)_n$heteroaryl, one or more amino acid residues, or a payload.

24. A composition comprising a polymer comprising at least five or more subunits comprising the structure:



wherein:

K is H;

X is O, NR, S or Se;

R is absent, -H, -$(CH_2)_n$alkyl, -$(CH_2)_n$alkenyl, -$(CH_2)_n$alkynyl, -$(CH_2)_n$cycloalkyl, -$(CH_2)_n$heterocyclyl, -$(CH_2)_n$aryl or -$(CH_2)_n$heteroaryl;

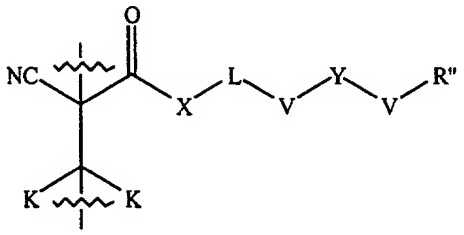
n is an integer from 0 to 10;

R' is a substituted organic residue; and

[R'--X] comprises at least one member selected from the group consisting of amino acid residues, payloads, and branched polyfunctional groups; and

wherein said subunits are covalently bonded together in a series.

25. The composition of claim 24, wherein said structure of said subunit comprises:



wherein:

K is H;

X is O, NR, S or Se;

R, independently for each occurrence, is -H, $-(CH_2)_n$alkyl, $-(CH_2)_n$alkenyl, $-(CH_2)_n$alkynyl, $-(CH_2)_n$cycloalkyl, $-(CH_2)_n$heterocyclyl, $-(CH_2)_n$aryl or $-(CH_2)_n$heteroaryl;

n, independently for each occurrence, is an integer from 0 to 10;

R" is a substituted organic residue;

L is absent or is $-(CH_2)_n$alkyl-, $-(CH_2)_n$alkenyl-, $-(CH_2)_n$alkynyl-, $-(CH_2)_nO(CH_2)_p$-, $-(CH_2)_nNR(CH_2)_p$-, $-(CH_2)_nS(CH_2)_p$-, $-(CH_2)_n$alkyl$(CH_2)_p$-, $-(CH_2)_n$alkenyl$(CH_2)_p$-, $-(CH_2)_n$alkynyl$(CH_2)_p$-, $-O(CH_2)_n$-, $-NR(CH_2)_n$-, or $-S(CH_2)_n$-;

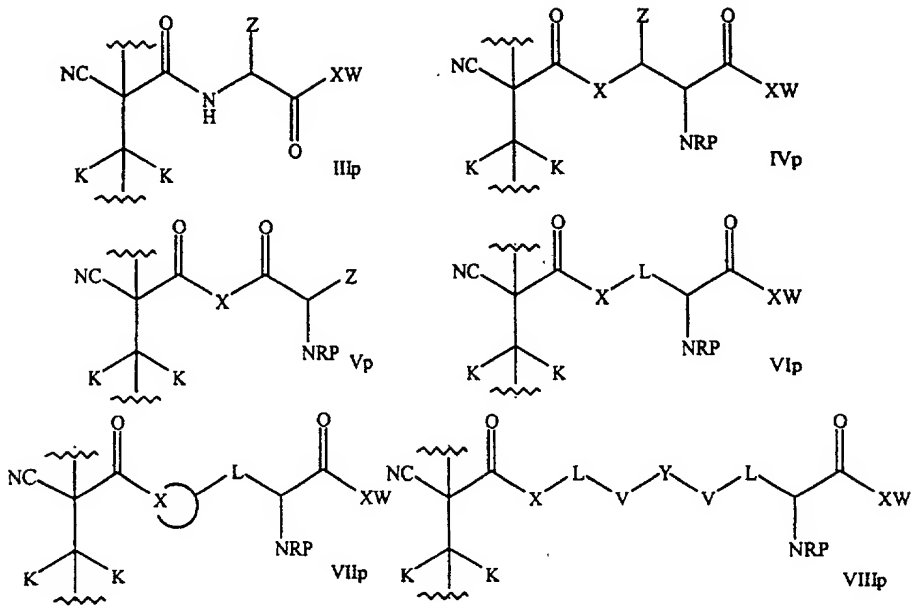
p is an integer from 0 to 10;

Y is absent or is C=O, SO_2, SO or C=S;

V, independently for each occurrence, is absent or is NR, O, S or Se; and

[R"--X] comprises at least one member selected from the group consisting of amino acid residues, payloads and branched polyfunctional groups.

26. The composition of claim 24, wherein said structure of said subunit comprises one of Formulae IIIp-VIIIp:



wherein:

K is H;

X, independently for each occurrence, is O, NR, S, or Se;

R, independently for each occurrence, is -H, $-(CH_2)_n$alkyl, $-(CH_2)_n$alkenyl, $-(CH_2)_n$alkynyl, $-(CH_2)_n$cycloalkyl, $-(CH_2)_n$heterocyclyl, $-(CH_2)_n$aryl or $-(CH_2)_n$heteroaryl;

n, independently for each occurrence, is an integer from 0 to 10;

L, independently for each occurrence, is absent or is $-(CH_2)_n$alkyl-, $-(CH_2)_n$alkenyl-, $-(CH_2)_n$alkynyl-, $-(CH_2)_nO(CH_2)_p$-, $-(CH_2)_nNR(CH_2)_p$-, $-(CH_2)_nS(CH_2)_p$-, $-(CH_2)_n$alkyl$(CH_2)_p$-, $-(CH_2)_n$alkenyl$(CH_2)_p$-, $-(CH_2)_n$alkynyl$(CH_2)_p$-, $-O(CH_2)_n$-, $-NR(CH_2)_n$- or $-S(CH_2)_n$-;

p, independently for each occurrence, is an integer from 0 to 10;

Y is absent or is C=O, SO_2, SO or C=S;

V, independently for each occurrence, is absent or is NR, O, S or Se;

P, independently for each occurrence, is H, lower alkyl or a nitrogen-protecting group;

W, independently for each occurrence, is $-(CH_2)_n$alkyl, $-(CH_2)_n$alkenyl, $-(CH_2)_n$alkynyl, $-(CH_2)_n$cycloalkyl, $-(CH_2)_n$heterocyclyl, $-(CH_2)_n$aryl or $-(CH_2)_n$heteroaryl, one or more amino acid residues, or a payload; and

Z, independently for each occurrence, is -H or a substituted or unsubstituted alkyl, alkenyl, alkynyl, cycloalkyl, aralkyl, aryl, or heterocyclyl.

27. The composition of claim 24, wherein said polymer comprises about fifty or more of said subunits in a repeating chain of covalently bonded subunits.

28. The composition of claim 24, further comprising a second polymer.

29. The composition of claim 28, wherein said second polymer comprises at least one member selected from the group consisting of poly(alkylene glycol), polysaccharide, poly(lactic-co-glycolic acid), poly(lactic acid), poly(glycolic acid), polyanhydride, polyphosphazene, polycaprolactone and polyorthoester.

30. The composition of claim 24, wherein R'--X is an amino acid residue.

31. The composition of claim 24, wherein R'--X is a residue of an amino acid selected from the group consisting of glycine, alanine, valine, cysteine, leucine, isoleucine, serine, threonine, methionine, glutamic acid, aspartic acid, glutamine, asparagine, lysine, arginine, proline, histidine, phenylalanine, tyrosine and tryptophan.

32. The composition of claim 24, wherein R'--X comprises a payload.

33. The composition of claim 24, wherein R'--X comprises a therapeutic agent.

34. The composition of claim 33, wherein said therapeutic agent comprises a vaccine.

35. The composition of claim 33, wherein said therapeutic agent comprises at least one member selected from the group consisting of analgesics; antiasthmatics; anticonvulsants; antidepressants; antiemetics; antigens and antibodies thereto; antihistamines; antihypertensive agents; antinauseants; anti-Parkinson agents; antispasmodics; apoproteins, bronchodilators; beta-blockers; chemotherapeutic agents; cardiovascular agents; central nervous system agents; coenzymes; decongestants; diuretics; enzymes; enzyme inhibitors; expectorants; glycoproteins; H-2 antagonists; haptens and antibodies thereto; hormones, lipids, liposomes; mucolytics; muscle relaxants; protein analogs in which at least one non-peptide linkage replaces a peptide linkage; phospholipids; prostaglandins; receptors and other membrane proteins; retro-inverso oligopeptides; stimulants; toxins; tranquilizers; and vitamins and mineral and nutritional additives.

36. The composition of claim 33, wherein said therapeutic agent comprises at least one member selected from the group consisting of antibiotics, antimicrobials, antiseptics, bacteriocins, bacteriostats, disinfectants, steroids, anesthetics, antifungal agents, anti-

inflammatory agents, antibacterial agents, antiviral agents, antitumor agents, growth promoting substances, and antioxidants.

37. The composition of claim 24, wherein R'--X comprises an imaging agent.

38. The composition of claim 37, wherein said imaging agent comprises at least one moiety selected from the group consisting of radionuclides, atoms with unpaired spin electrons, free radicals and contrast agents.

39. The composition of claim 37, wherein said imaging agent is detectable through its emission of light, radioactivity or chemical signals.

40. The composition of claim 37, wherein said imaging agent is detectable through absorbing or reflecting radiation.

41. The composition of claim 24, wherein R'--X comprises a targeting moiety.

42. The composition of claim 41, wherein said targeting moiety comprises at least one member selected from the group consisting of lipids, antibodies, lectins, ligands, sugars, steroids, hormones, nutrients and proteins.

43. The composition of claim 41, wherein said targeting moiety comprises an internalizing polypeptide sequence.

44. The composition of claim 41, wherein said targeting moiety comprises at least one molecule selected from the group consisting of biotin, folates, riboflavin, carnitine, inositol, lipoic acid, niacin, pantothenic acid, thiamin, pyridoxal, ascorbic acid, lipid soluble vitamins A, D, E and K, steroidal lipids and steroidal hormones

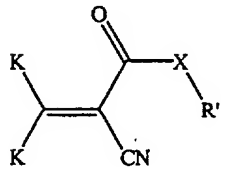
45. The composition of claim 41, wherein said targeting moiety comprises an antibody or an antisense oligonucleotide.

46. The composition of claim 41, wherein said targeting moiety comprises at least one member selected from the group consisting of antigens, antisense oligonucleotides, antibodies, lectin, receptor ligands and sugars.

47. The composition of claim 24, wherein the composition further comprises at least one payload encased in said polymer.

48. The composition of claim 47, wherein said polymer is formed as a nanoparticle or a microparticle.

49. A biocompatible polymer, formed by polymerization of monomers having the structure:



wherein:

K, independently for each occurrence, is H, lower alkyl, lower alkenyl, lower alkynyl, heterocyclyl, or aryl;

X is O, NR, S or Se;

R is absent, -H, -$(CH_2)_n$alkyl, -$(CH_2)_n$alkenyl, -$(CH_2)_n$alkynyl, -$(CH_2)_n$cycloalkyl, -$(CH_2)_n$heterocyclyl, -$(CH_2)_n$aryl or -$(CH_2)_n$heteroaryl;

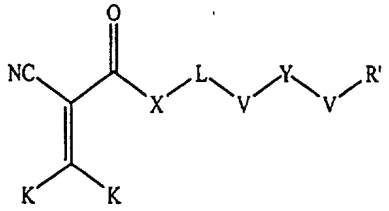
n is an integer from 0 to 10;

R' is a substituted organic residue; and

[R'--X] comprises at least one member selected from the group consisting of amino acid residues, payloads, and branched polyfunctional groups; and

wherein application of said monomer to a patient results in formation of said biocompatible polymer by polymerization of said monomer.

50. The polymer of claim 49, wherein said structure comprises:



wherein:

K, independently for each occurrence, is H, lower alkyl, lower alkenyl, lower alkynyl, heterocyclyl, or aryl;

X is O, NR, S or Se;

R, independently for each occurrence, is -H, -$(CH_2)_n$alkyl, -$(CH_2)_n$alkenyl, -$(CH_2)_n$alkynyl, -$(CH_2)_n$cycloalkyl, -$(CH_2)_n$heterocyclyl, -$(CH_2)_n$aryl or -$(CH_2)_n$heteroaryl;

n, independently for each occurrence, is an integer from 0 to 10;

R" is a substituted organic residue;

L is absent or is $-(CH_2)_n$alkyl-, $-(CH_2)_n$alkenyl-, $-(CH_2)_n$alkynyl-, $-(CH_2)_nO(CH_2)_p-$, $-(CH_2)_nNR(CH_2)_p-$, $-(CH_2)_nS(CH_2)_p-$, $-(CH_2)_n$alkyl$(CH_2)_p-$, $-(CH_2)_n$alkenyl$(CH_2)_p-$, $-(CH_2)_n$alkynyl$(CH_2)_p-$, $-O(CH_2)_n-$, $-NR(CH_2)_n-$, or $-S(CH_2)_n-$;

p is an integer from 0 to 10;

Y is absent or is C=O, SO_2, SO or C=S;

V, independently for each occurrence, is absent or is NR, O, S or Se; and

[R"--X] comprises at least one member selected from the group consisting of amino acid residues, payloads, and branched polyfunctional groups.

51. The polymer of claim 49, wherein R'--X is an amino acid residue.

52. The polymer of claim 49, wherein R'--X is a residue of an amino acid selected from the group consisting of glycine, alanine, valine, cysteine, leucine, isoleucine, serine, threonine, methionine, glutamic acid, aspartic acid, glutamine, asparagine, lysine, arginine, proline, histidine, phenylalanine, tyrosine and tryptophan.

53. The polymer of claim 49, wherein R'--X comprises a payload.

54. The polymer of claim 49, wherein R'--X comprises a therapeutic agent.

55. The polymer of claim 54, wherein said therapeutic agent comprises a vaccine.

56. The polymer of claim 54, wherein said therapeutic agent comprises at least one member selected from the group consisting of analgesics; antiasthmatics; anticonvulsants; antidepressants; antiemetics; antigens and antibodies thereto; antihistamines; antihypertensive agents; antinauseants; anti-Parkinson agents; antispasmodics; apoproteins, bronchodilators; beta-blockers; chemotherapeutic agents; cardiovascular agents; central nervous system agents; coenzymes; decongestants; diuretics; enzymes; enzyme inhibitors; expectorants; glycoproteins; H-2 antagonists; haptens and antibodies thereto; hormones, lipids, liposomes; mucolytics; muscle relaxants; protein analogs in which at least one non-peptide linkage replaces a peptide linkage; phospholipids; prostaglandins; receptors and other membrane proteins; retro-inverso oligopeptides; stimulants; toxins; tranquilizers; and vitamins and mineral and nutritional additives.

57. The polymer of claim 54, wherein said therapeutic agent comprises at least one member selected from the group consisting of antibiotics, antimicrobials, antiseptics, bacteriocins, bacteriostats, disinfectants, steroids, anesthetics, antifungal agents, anti-

inflammatory agents, antibacterial agents, antiviral agents, antitumor agents, growth promoting substances, and antioxidants.

58. The polymer of claim 49, wherein R'--X comprises an imaging agent.

59. The polymer of claim 58, wherein said imaging agent comprises at least one moiety selected from the group consisting of radionuclides, atoms with unpaired spin electrons, free radicals and contrast agents.

60. The polymer of claim 58, wherein said imaging agent is detectable through its emission of light, radioactivity or chemical signals.

61. The polymer of claim 58, wherein said imaging agent is detectable through absorbing or reflecting radiation.

62. The polymer of claim 49, wherein R'--X comprises a targeting moiety.

63. The polymer of claim 62, wherein said targeting moiety comprises at least one member selected from the group consisting of lipids, antibodies, lectins, ligands, sugars, steroids, hormones, nutrients and proteins.

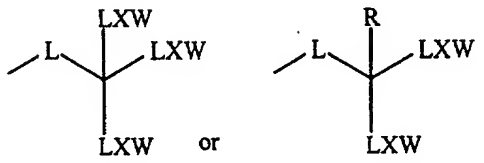
64. The polymer of claim 62, wherein said targeting moiety comprises an internalizing polypeptide sequence.

65. The polymer of claim 62, wherein said targeting moiety comprises at least one molecule selected from the group consisting of biotin, folates, riboflavin, carnitine, inositol, lipoic acid, niacin, pantothenic acid, thiamin, pyridoxal, ascorbic acid, lipid soluble vitamins A, D, E and K, steroidal lipids and steroidal hormones

66. The polymer of claim 62, wherein said targeting moiety comprises an antibody or an antisense oligonucleotide.

67. The polymer of claim 62, wherein said targeting moiety comprises at least one member selected from the group consisting of antigens, antisense oligonucleotides, antibodies, lectin, receptor ligands and sugars.

68. The composition of claim 49, wherein R' comprises the structure:



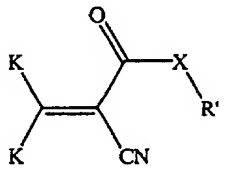
L, independently for each occurrence, is absent or is -$(CH_2)_n$alkyl-, -$(CH_2)_n$alkenyl-, -$(CH_2)_n$alkynyl-, -$(CH_2)_nO(CH_2)_p$-, -$(CH_2)_nNR(CH_2)_p$-, -$(CH_2)_nS(CH_2)_p$-, -$(CH_2)_n$alkyl$(CH_2)_p$-, -$(CH_2)_n$alkenyl$(CH_2)_p$-, -$(CH_2)_n$alkynyl$(CH_2)_p$-, -$O(CH_2)_n$-, -$NR(CH_2)_n$-, or -$S(CH_2)_n$-;

p, independently for each occurrence, is an integer from 0 to 10; and

W, independently for each occurrence, is -$(CH_2)_n$alkyl, -$(CH_2)_n$alkenyl, -$(CH_2)_n$alkynyl, -$(CH_2)_n$cycloalkyl, -$(CH_2)_n$heterocyclyl, -$(CH_2)_n$aryl or -$(CH_2)_n$heteroaryl, one or more amino acid residues, or a payload.

69. A method for forming a biocompatible polymer, comprising

(a) providing a composition comprising a monomer comprising the structure:



wherein:

K, independently for each occurrence, is H, lower alkyl, lower alkenyl, lower alkynyl, heterocyclyl, or aryl;

X is O, NR, S or Se;

R is absent, -H, -$(CH_2)_n$alkyl, -$(CH_2)_n$alkenyl, -$(CH_2)_n$alkynyl, -$(CH_2)_n$cycloalkyl, -$(CH_2)_n$heterocyclyl, -$(CH_2)_n$aryl or -$(CH_2)_n$heteroaryl;

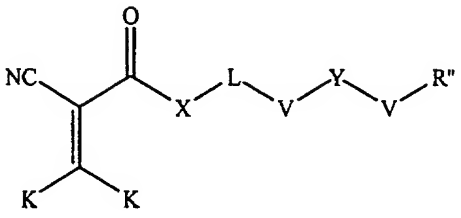
n is an integer from 0 to 10;

R' is a substituted organic residue; and

[R'--X] comprises at least one member selected from the group consisting of amino acid residues, payloads, and branched polyfunctional groups; and

(b) contacting said composition with a substance capable of initiating polymerization of said monomer to form a biocompatible polymer.

70. The method of claim 69, wherein said structure comprises:



wherein:

K, independently for each occurrence, is H, lower alkyl, lower alkenyl, lower alkynyl, heterocyclyl, or aryl;

X is O, NR, S or Se; ;

R, independently for each occurrence, is -H, $-(CH_2)_n$alkyl, $-(CH_2)_n$alkenyl, $-(CH_2)_n$alkynyl, $-(CH_2)_n$cycloalkyl, $-(CH_2)_n$heterocyclyl, $-(CH_2)_n$aryl or $-(CH_2)_n$heteroaryl;

n, independently for each occurrence, is an integer from 0 to 10;

R" is a substituted organic residue;

L is absent or is $-(CH_2)_n$alkyl-, $-(CH_2)_n$alkenyl-, $-(CH_2)_n$alkynyl-, $-(CH_2)_nO(CH_2)_p$-, $-(CH_2)_nNR(CH_2)_p$-, $-(CH_2)_nS(CH_2)_p$-, $-(CH_2)_n$alkyl$(CH_2)_p$-, $-(CH_2)_n$alkenyl$(CH_2)_p$-, $-(CH_2)_n$alkynyl$(CH_2)_p$-, $-O(CH_2)_n$-, $-NR(CH_2)_n$-, or $-S(CH_2)_n$-;

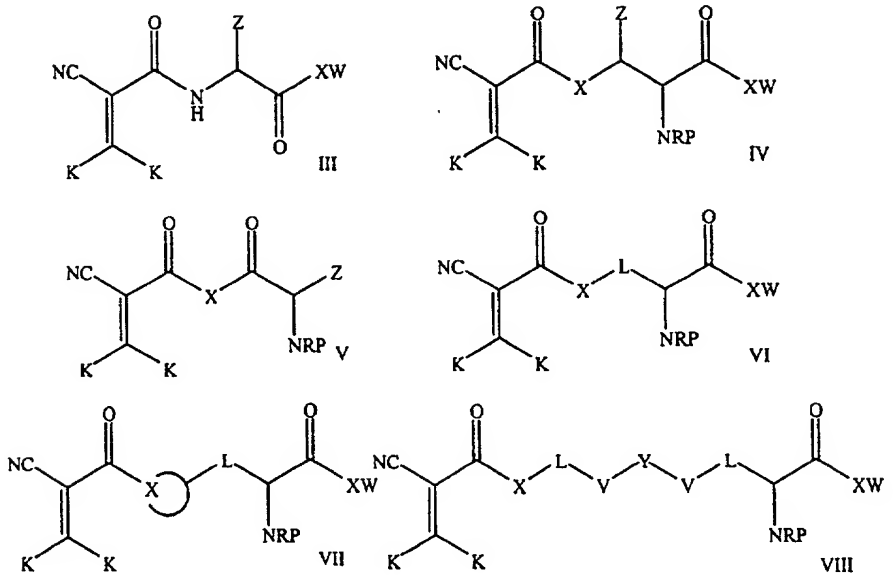
p is an integer from 0 to 10;

Y is absent or is C=O, SO_2, SO or C=S;

V, independently for each occurrence, is absent or is NR, O, S or Se; and

[R"--X] comprises at least one member selected from the group consisting of amino acid residues, payloads, and branched polyfunctional groups.

71. The method of claim 69, wherein said structure comprises one of Formulae III-VIII:



wherein:

K, independently for each occurrence, is H, lower alkyl, lower alkenyl, lower alkynyl, heterocyclyl, or aryl;

X, independently for each occurrence, is O, NR, S, or Se;

R, independently for each occurrence, is -H, $-(CH_2)_n$alkyl, $-(CH_2)_n$alkenyl, $-(CH_2)_n$alkynyl, $-(CH_2)_n$cycloalkyl, $-(CH_2)_n$heterocyclyl, $-(CH_2)_n$aryl or $-(CH_2)_n$heteroaryl;

n, independently for each occurrence, is an integer from 0 to 10;

L, independently for each occurrence, is absent or represents $-(CH_2)_n$alkyl-, $-(CH_2)_n$alkenyl-, $-(CH_2)_n$alkynyl-, $-(CH_2)_nO(CH_2)_p$-, $-(CH_2)_nNR(CH_2)_p$-, $-(CH_2)_nS(CH_2)_p$-, $-(CH_2)_n$alkyl$(CH_2)_p$-, $-(CH_2)_n$alkenyl$(CH_2)_p$-, $-(CH_2)_n$alkynyl$(CH_2)_p$-, $-O(CH_2)_n$-, $-NR(CH_2)_n$-, or $-S(CH_2)_n$-;

p, independently for each occurrence, is an integer from 0 to 10;

Y is absent or is C=O, SO_2, SO or C=S;

V, independently for each occurrence, is absent or is NR, O, S or Se;

P, independently for each occurrence, is H, lower alkyl or a nitrogen-protecting group;

W, independently for each occurrence, is -$(CH_2)_n$alkyl, -$(CH_2)_n$alkenyl, -$(CH_2)_n$alkynyl, -$(CH_2)_n$cycloalkyl, -$(CH_2)_n$heterocyclyl, -$(CH_2)_n$aryl or -$(CH_2)_n$heteroaryl, one or more amino acid residues, or a payload; and

Z, independently for each occurrence, is -H or a substituted or unsubstituted alkyl, alkenyl, alkynyl, cycloalkyl, aralkyl, aryl, or heterocyclyl.

72. The method of claim 69, wherein each of K is H.

73. The method of claim 69, comprising contacting said composition with biological tissue of a patient *in vivo*.

74. The method of claim 73, wherein said composition further comprises at least one member selected from the group consisting of an additive, an inhibitor, a stabilizer, a formaldehyde concentration reducing agent, a filler, a thickening agent, a cross-linking agent and an initiator.

75. The method of claim 73, wherein said substance comprises an initiator.

76. The method of claim 73, comprising applying said composition to a break in the tissue of a patient.

77. The method of claim 73, comprising disposing in a lumen of a patient a quantity of said composition, wherein polymerization of said monomer results in said biocompatible polymer substantially blocking said lumen.

78. The method of claim 77, wherein said lumen is selected from the group consisting of a reproductive duct, a canalicular canal, a blood vessel, a bronchial tube, and a gap in a biological tissue.

79. The method of claim 73, wherein polymerization of said monomer results in a film of said biocompatible polymer on said tissue.

80. The method of claim 73, comprising applying said monomer to a medical device and tissue of a patient, wherein polymerization of said monomer results in a biocompatible polymer that substantially secures said medical device to said tissue.

81. The method of claim 80, wherein said medical device is selected from the group consisting of a catheter, a pin, a transdermal patch, an electrode patch, a feeding tube, a breathing tube and a catheter guide.

82. The method of claim 73, further comprising adding at least one payload to said composition, wherein polymerization of said monomer results in a biocompatible polymer encapsulating said payload.

83. The method of claim 82, wherein degradation of said biocompatible polymer results in controlled release of at least one said encased payload.

84. The method of claim 82, wherein said encased payload comprises a therapeutic agent.

85. The method of claim 82, wherein at least one said payload comprises a gene delivery system.

86. The method of claim 82, wherein at least one said payload comprises a nucleic acid.

87. The method of claim 73, wherein R'--X is an amino acid residue.

88. The method of claim 73, wherein R'--X comprises a payload.

89. The method of claim 73, wherein R'--X comprises a therapeutic agent.

90. The method of claim 89, wherein degradation of said polymer in vivo releases a systemically therapeutically effective amount of said therapeutic agent to said patient.

91. The method of claim 89, wherein degradation of said polymer in vivo releases a locally therapeutically effective amount of said therapeutic agent to said patient.

92. The method of claim 91, wherein said tissue comprises an infection.

93. The method of claim 91, wherein said tissue comprises a tumor.

94. The method of claim 91, wherein said amount is a prophylactically effective amount selected to protect the patient against an unwanted condition.

95. The method of claim 91, wherein said therapeutic agent comprises a vaccine.

96. The method of claim 90, wherein said therapeutic agent comprises at least one member selected from the group consisting of analgesics; antiasthmatics; anticonvulsants; antidepressants; antiemetics; antigens and antibodies thereto; antihistamines; antihypertensive agents; antinauseants; anti-Parkinson agents; antispasmodics; apoproteins, bronchodilators; beta-blockers; chemotherapeutic agents; cardiovascular agents; central nervous system agents; coenzymes; decongestants; diuretics; enzymes; enzyme inhibitors; expectorants; glycoproteins; H-2 antagonists; haptens and antibodies thereto; hormones, lipids, liposomes; mucolytics; muscle relaxants; protein analogs in which at least one non-peptide linkage replaces a peptide linkage; phospholipids; prostaglandins; receptors and other membrane proteins; retro-inverso oligopeptides; stimulants; toxins; tranquilizers; and vitamins and mineral and nutritional additives.

97. The method of claim 89, wherein said therapeutic agent comprises at least one member selected from the group consisting of antibiotics, antimicrobials, antiseptics, bacteriocins, bacteriostats, disinfectants, steroids, anesthetics, antifungal agents, anti-inflammatory agents, antibacterial agents, antiviral agents, antitumor agents, growth promoting substances, and antioxidants.

98. The method of claim 73, wherein R'--X comprises an imaging agent.

99. The method of claim 98, wherein said imaging agent is used for diagnosis.

100. The method of claim 98, wherein said imaging agent is used to monitor treatment.

101. The method of claim 98, wherein said imaging agent comprises at least one moiety selected from the group consisting of radionuclides, atoms with unpaired spin electrons, free radicals and contrast agents.

102. The method of claim 98, wherein said imaging agent is detectable through its emission of light, radioactivity or chemical signals.

103. The method of claim 98, wherein said imaging agent is detectable through absorbing or reflecting radiation.

104. The method of claim 73, wherein R'--X comprises a targeting moiety.

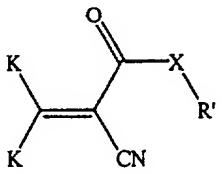
105. The method of claim 104, wherein said targeting moiety comprises at least one member selected from the group consisting of lipids, antibodies, lectins, ligands, sugars, steroids, hormones, nutrients and proteins.

106. The method of claim 104, wherein said targeting moiety comprises an internalizing polypeptide sequence.

107. The method of claim 104, wherein said targeting moiety comprises at least one molecule selected from the group consisting of biotin, folates, riboflavin, carnitine, inositol, lipoic acid, niacin, pantothenic acid, thiamin, pyridoxal, ascorbic acid, lipid soluble vitamins A, D, E and K, steroidal lipids and steroidal hormones

108. The method of claim 104, wherein said targeting moiety comprises an antibody or an antisense oligonucleotide.

109. A method for delivering a therapeutic or diagnostic agent to a patient, comprising administering to a patient a composition comprising a biocompatible polymer of at least one monomer comprising the structure:



wherein:

K, independently for each occurrence, is H, lower alkyl, lower alkenyl, lower alkynyl, heterocyclyl, or aryl;

X is O, NR, S or Se;

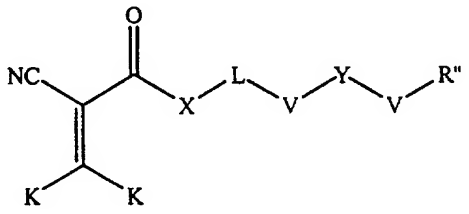
R is absent, -H, $-(CH_2)_n$alkyl, $-(CH_2)_n$alkenyl, $-(CH_2)_n$alkynyl, $-(CH_2)_n$cycloalkyl, $-(CH_2)_n$heterocyclyl, $-(CH_2)_n$aryl or $-(CH_2)_n$heteroaryl;

n is an integer from 0 to 10;

R' is a substituted organic residue; and

[R'--X] comprises at least one member selected from the group consisting of amino acid residues, payloads, and branched polyfunctional groups.

110. The method of claim 109, wherein said structure comprises:



wherein:

K, independently for each occurrence, is H, lower alkyl, lower alkenyl, lower alkynyl, heterocyclyl, or aryl;

X is O, NR, S or Se; ;

R, independently for each occurrence, is -H, $-(CH_2)_n$alkyl, $-(CH_2)_n$alkenyl, $-(CH_2)_n$alkynyl, $-(CH_2)_n$cycloalkyl, $-(CH_2)_n$heterocyclyl, $-(CH_2)_n$aryl or $-(CH_2)_n$heteroaryl;

n, independently for each occurrence, is an integer from 0 to 10;

R" is a substituted organic residue;

L is absent or is $-(CH_2)_n$alkyl-, $-(CH_2)_n$alkenyl-, $-(CH_2)_n$alkynyl-, $-(CH_2)_nO(CH_2)_p$-, $-(CH_2)_nNR(CH_2)_p$-, $-(CH_2)_nS(CH_2)_p$-, $-(CH_2)_n$alkyl$(CH_2)_p$-, $-(CH_2)_n$alkenyl$(CH_2)_p$-, $-(CH_2)_n$alkynyl$(CH_2)_p$-, $-O(CH_2)_n$-, $-NR(CH_2)_n$-, or $-S(CH_2)_n$-;

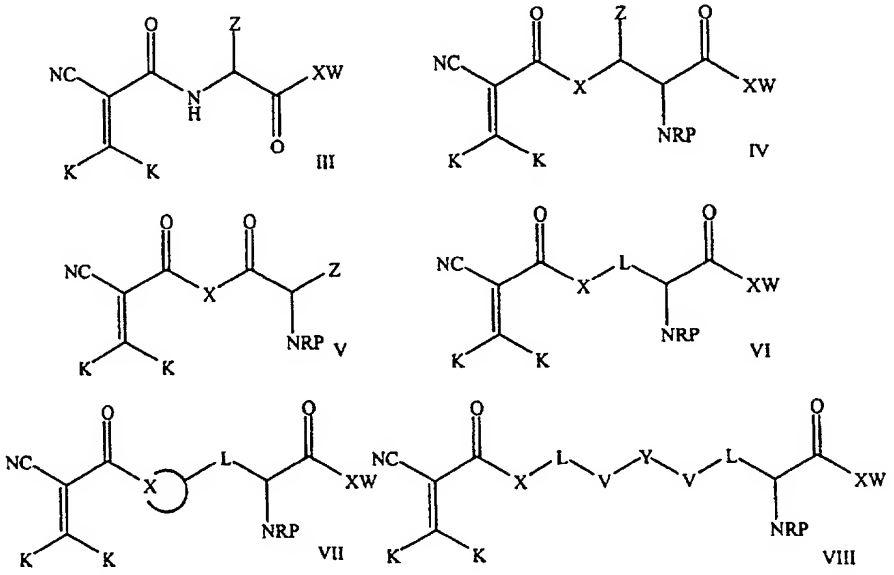
p is an integer from 0 to 10;

Y is absent or is C=O, SO_2, SO or C=S;

V, independently for each occurrence, is absent or is NR, O, S or Se; and

[R"--X] comprises at least one member selected from the group consisting of amino acid residues, payloads, and branched polyfunctional groups.

111. The method of claim 109, wherein said structure comprises one of Formulae III-VIII:



wherein:

K, independently for each occurrence, is H, lower alkyl, lower alkenyl, lower alkynyl, heterocyclyl, or aryl;

X, independently for each occurrence, is O, NR, S, or Se;

R, independently for each occurrence, is -H, $-(CH_2)_n$alkyl, $-(CH_2)_n$alkenyl, $-(CH_2)_n$alkynyl, $-(CH_2)_n$cycloalkyl, $-(CH_2)_n$heterocyclyl, $-(CH_2)_n$aryl or $-(CH_2)_n$heteroaryl;

n, independently for each occurrence, is an integer from 0 to 10;

L, independently for each occurrence, is absent or represents $-(CH_2)_n$alkyl-, $-(CH_2)_n$alkenyl-, $-(CH_2)_n$alkynyl-, $-(CH_2)_nO(CH_2)_p$-, $-(CH_2)_nNR(CH_2)_p$-, $-(CH_2)_nS(CH_2)_p$-,

$-(CH_2)_n$alkyl$(CH_2)_p$-, $-(CH_2)_n$alkenyl$(CH_2)_p$-, $-(CH_2)_n$alkynyl$(CH_2)_p$-, $-O(CH_2)_n$-, $-NR(CH_2)_n$-, or $-S(CH_2)_n$-;

p, independently for each occurrence, is an integer from 0 to 10;

Y is absent or is C=O, SO_2, SO or C=S;

V, independently for each occurrence, is absent or is NR, O, S or Se;

P, independently for each occurrence, is H, lower alkyl or a nitrogen-protecting group;

W, independently for each occurrence, is $-(CH_2)_n$alkyl, $-(CH_2)_n$alkenyl, $-(CH_2)_n$alkynyl, $-(CH_2)_n$cycloalkyl, $-(CH_2)_n$heterocyclyl, $-(CH_2)_n$aryl or $-(CH_2)_n$heteroaryl, one or more amino acid residues, or a payload; and

Z, independently for each occurrence, is -H or a substituted or unsubstituted alkyl, alkenyl, alkynyl, cycloalkyl, aralkyl, aryl, or heterocyclyl.

112. The method of claim 109, wherein each of K is H.

113. The method of claim 109, comprising contacting said monomer with biological tissue of said patient and allowing said monomer to polymerize.

114. The method of claim 109, comprising polymerizing said monomer and thereafter administering said composition to said patient.

115. The method of claim 109, comprising applying said composition to internal tissue of said patient.

116. The method of claim 109, comprising applying said composition to a break in the tissue of a patient.

117. The method of claim 109, wherein polymerization of said monomer results in said biocompatible polymer substantially blocking a lumen of said patient.

118. The method of claim 117, wherein said lumen is selected from the group consisting of a reproductive duct, a canalicular canal, a blood vessel, a bronchial tube, and a gap in a biological tissue.

119. The method of claim 109, wherein polymerization of said monomer results in a film of said biocompatible polymer on tissue of said patient.

120. The method of claim 109, comprising applying said monomer to a medical device and tissue of a patient, wherein polymerization of said monomer results in a biocompatible polymer that substantially secures said medical device to said tissue.

121. The method of claim 120, wherein said medical device is selected from the group consisting of a catheter, a pin, a transdermal patch, an electrode patch, a feeding tube, a breathing tube and a catheter guide.

122. The method of claim 109, further comprising adding at least one payload to said composition, wherein polymerization of said monomer results in said biocompatible polymer encapsulating said payload.

123. The method of claim 122, wherein degradation of said biocompatible polymer results in controlled release of at least one said encased payload to said patient.

124. The method of claim 122, wherein said encased payload comprises a therapeutic agent.

125. The method of claim 122, wherein at least one said payload comprises a gene delivery system.

126. The method of claim 122, wherein at least one said payload comprises a nucleic acid.

127. The method of claim 109, wherein R'--X is an amino acid residue.

128. The method of claim 109, wherein R'--X comprises a payload.

129. The method of claim 109, wherein R'--X comprises a therapeutic agent.

130. The method of claim 129, wherein degradation of said polymer in vivo releases a systemically therapeutically effective amount of said therapeutic agent to said patient.

131. The method of claim 129, wherein degradation of said polymer in vivo releases a locally therapeutically effective amount of said therapeutic agent to said patient.

132. The method of claim 131, wherein said tissue comprises an infection.

133. The method of claim 131, wherein said tissue comprises a tumor.

134. The method of claim 130, wherein said amount is a prophylactically effective amount selected to protect the patient against an unwanted condition.

135. The method of claim 130, wherein said therapeutic agent comprises a vaccine.

136. The method of claim 129, wherein said therapeutic agent comprises at least one member selected from the group consisting of analgesics; antiasthmatics; anticonvulsants; antidepressants; antiemetics; antigens and antibodies thereto; antihistamines; antihypertensive agents; antinauseants; anti-Parkinson agents; antispasmodics; apoproteins, bronchodilators; beta-blockers; chemotherapeutic agents; cardiovascular agents; central nervous system agents; coenzymes; decongestants; diuretics; enzymes; enzyme inhibitors; expectorants; glycoproteins;

H-2 antagonists; haptens and antibodies thereto; hormones, lipids, liposomes; mucolytics; muscle relaxants; protein analogs in which at least one non-peptide linkage replaces a peptide linkage; phospholipids; prostaglandins; receptors and other membrane proteins; retro-inverso oligopeptides; stimulants; toxins; tranquilizers; and vitamins and mineral and nutritional additives.

137. The method of claim 129, wherein said therapeutic agent comprises at least one member selected from the group consisting of antibiotics, antimicrobials, antiseptics, bacteriocins, bacteriostats, disinfectants, steroids, anesthetics, antifungal agents, anti-inflammatory agents, antibacterial agents, antiviral agents, antitumor agents, growth promoting substances, and antioxidants.

138. The method of claim 109, wherein R'--X comprises an imaging agent.

139. The method of claim 138, wherein said imaging agent is used for diagnosis.

140. The method of claim 138, wherein said imaging agent is used to monitor treatment.

141. The method of claim 138, wherein said imaging agent comprises at least one moiety selected from the group consisting of radionuclides, atoms with unpaired spin electrons, free radicals and contrast agents.

142. The method of claim 138, wherein said imaging agent is detectable through its emission of light, radioactivity or chemical signals.

143. The method of claim 138, wherein said imaging agent is detectable through absorbing or reflecting radiation.

144. The method of claim 109, wherein R'--X comprises a targeting moiety.

145. The method of claim 144, wherein said targeting moiety comprises at least one member selected from the group consisting of lipids, antibodies, lectins, ligands, sugars, steroids, hormones, nutrients and proteins.

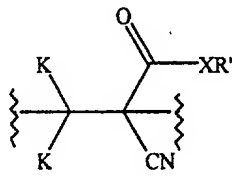
146. The method of claim 145, wherein said targeting moiety comprises an internalizing polypeptide sequence.

147. The method of claim 146, wherein said targeting moiety comprises at least one molecule selected from the group consisting of biotin, folates, riboflavin, carnitine, inositol, lipoic acid, niacin, pantothenic acid, thiamin, pyridoxal, ascorbic acid, lipid soluble vitamins A, D, E and K, steroidal lipids and steroidal hormones

148. The method of claim 147, wherein said targeting moiety comprises an antibody or an antisense oligonucleotide.

149. An in vitro system for growth of cells comprising:

(a) a matrix comprising a biocompatible polymer comprising at least about ten or more subunits comprising the structure:



wherein:

K is H;

X is O, NR, S or Se;

R is absent, -H, -$(CH_2)_n$alkyl, -$(CH_2)_n$alkenyl, -$(CH_2)_n$alkynyl, -$(CH_2)_n$cycloalkyl, -$(CH_2)_n$heterocyclyl, -$(CH_2)_n$aryl or -$(CH_2)_n$heteroaryl;

n is an integer from 0 to 10;

R' is a substituted organic residue; and

[R'--X] comprises at least one member selected from the group consisting of amino acid residues, payloads, and branched polyfunctional groups; wherein said subunits are covalently bonded together in a series; and

(b) cells attached to said matrix.

150. The system of claim 149, wherein said matrix is sufficiently porous to permit diffusion of nutrients and gases to said cells for their growth.

151. The system of claim 149, wherein said matrix is suitable for implantation in a patient.